Steady Flow Measurements In A Vaneless Diffuser

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Summary

Experimental measurements of steady flow characteristics in a vaneless diffuser of a centrifugal blower were carried out. The mass flow rate through the blower was maintained at its maximum throughout the experiment to ensure that no self-exited flow oscillation occurs in the diffuser. The symmetrical flow field in the diffuser was measured along a radial path using an X-wire probe. The flow angle measured at half of the diffuser width did not exceed 68 from the diffuser inlet to its outlet-a value less than the critical flow angle of ~78 reported in the open literature. Negative radial velocities were measured in the vicinity of the shroud wall, which confirms some reported idea that the presence of a recirculation zone on either of the diffuser walls does not automatically indicate the presence of self-excited flow oscillations in the diffuser. Reynolds stresses profiles showed that turbulent mixing, which diminishes with diffuser radial distance, is more in the vicinity of the shroud as compared to the hub. This data is a useful tool for vaneless diffuser calculation model developers